INTRODUCING BACCALAUREATE NURSING STUDENTS TO THE USE OF COMPUTERS IN HEALTH CARE

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Abstract

This paper describes an elective course about computers in health care which has been taught at the State University of New York at Buffalo School of Nursing for the past five years. The objectives, content, methods of instruction and evaluation of the course are discussed. Emphasis is placed on the students response to the course and their suggestion to integrate selected aspects of it into the undergraduate curriculum. Issues related to the role of the faculty in this integration and their preparation for such a role are considered.

Introduction

Health professionals are becoming increasingly aware of the inevitability of a collaborative relationship between themselves and computers. As part of this increasing awareness, for the past several years nurses have been publishing articles which describe actual and potential applications of computers to the care of patients and to nursing administration, education and research. One of the first of these nursing publications was a monograph entitled "Technical Innovations in Health Care: Nursing Implications" published in 1962 by the American Nurses Association. In this collection of papers, Peplau acknowledged and described the potential effects of the computer[1] on nurses, nursing and the delivery of health care. During the mid-sixties, articles were written describing computer applications in nursing and the benefits which derived from them. One of the earliest of these was by Rosenberg and Carriker and appeared in May 1966 issue of the American Journal of Nursing. In the article the authors described the development and use of automated nurses' notes. Since that time, several articles have appeared in nursing literature describing broader and more sophisticated applications of computers to nursing and health care.

Many of the articles have either implied or stated directly the importance of nurses having some knowledge about computers and their application to health care. Zielstorff, in an article in the Journal of Nursing Administration in 1975 stated:

> It behooves us all to become and remain knowledgeable about this technology (computer). It has enormous potential for assisting nurses in clarifying, teaching, implementing and expanding the principles[2] of high quality patient care.

In 1976, Hannah stated in Nursing Outlook:

> ...nurses in general still seem to feel threatened by them (computers) and are resistant to automation. I believe that these reactions are due to fear of the unknown[3].

> ...In the health care professions, we are beginning to experience the profound impact that computers will ultimately have on nursing practice and patient care. Our decision must be whether to act as we have traditionally and have change thrust upon us from outside the ranks of our own profession or to anticipate this revolution in our practice, familiarize ourselves with it, and prepare to take an active part in the introduction of computers into the nursing world[4].

Phrases such as "become and remain knowledgeable", "fear of the unknown" and "anticipate this revolution in our practice, familiarize ourselves with it and take an active part in the introduction of computers into the nursing world" indicate that there is recognition on the part of some nursing leaders that nurses should have knowledge of the computer and its applications to health care.

In the early 1970's a study to identify the needs of health personnel for education in medical computing was conducted under the auspices of the International Federation of Information Processing. A questionnaire was sent to health care personnel in Western developed countries who were members of the International Federation of Information Processing. The survey indicated that the respondents believed that all nurses should have a general knowledge of the computer and data processing, and that this content should be part of the curricula of nursing schools. Respondents also indicated that they believed that a large number of nurses should be educated to the point where they

could use a computer effectively and contribute to the development of automated systems[5]. These findings seem to indicate an awareness throughout the Western World of the need for educating nurses in the area of medical information sciences. Yet educators as a group have done little to develop curricula which will prepare students to practice collaboratively with a computer or to participate in the development of computer applications to health care.

Development of the Course

In order to provide nursing students with an opportunity to learn about computers in health care, an elective course entitled, "Implications of Computer Technology for Nursing" has been developed at the School of Nursing, State University of New York at Buffalo[15]. The purpose of the course is to familiarize the nursing student with the present and potential impact of computers on the health care system, the health care professional and the patient. The major objectives are to develop the student's ability to:

1. Describe the major factors which have affected the development of computer applications in the health care system.

2. Identify the benefits and constraints of a computerized information system for both the health professional and consumer.

3. Comprehend the basic concepts of computerized information processing.

4. Describe major applications of computers in the area of:
   a. patient care
   b. administration of health services
   c. health science education
   d. health care research

5. Understand how professional practice could be enhanced by the acceptance and use of computers.

6. Interact with a computer through a remote terminal utilizing a CAI program in nursing.

In order to achieve these objectives, the student is introduced to five major areas related to the implications of computer technology for nursing. These areas are:

1. The Importance of Technology in Contemporary Society

2. Basic Concepts of Computerized Data Processing

3. Present and Potential Applications of Computers in the Health Sciences

4. The Nurse as a Participant in a Computerized Information System

5. Social/Ethical Aspects of Health Data Automation

At the beginning of the course, the attitudes and knowledge of the students with respect to computers are assessed through the use of a questionnaire followed by group discussion. In 1977, (the first time the course was offered), negative attitudes were far more prevalent than positive attitudes. At that time students described the computer with words such as: "brain", "dehumanizing", "unreliable", "scary", "complicated", "takes people's jobs away". In 1981, the opposite is true; positive attitudes are more common and although the computer is still viewed as "scary" and "complicated", it is also seen as "interesting", "helpful", and "part of our future".

The content of the course begins with an exploration of the importance of technology in modern society. The areas discussed include man-machine relationships, the evaluation of the computer and its applications, the capabilities and limitations of computers and the attitudes of individuals toward computers. In 1977, fears of the computer dehumanizing health care and replacing essential professional nursing functions were of great concern to the students. In 1981, students seem much less threatened by such issues.

The technical aspects of computerized data processing are presented as the second major topic in the course. The purpose of this unit of study is to familiarize the students with some of the vocabulary of the computer/information scientist as well as to assist them in gaining a basic understanding of the way in which a computer functions. This is accomplished through a discussion of cybernetic systems, digital computers, computer hardware and computer software. Students are introduced to the techniques of flow charting and computer programming. They develop flow charts describing the flow of information in work settings which are familiar to them. The first time the course was taught, computer programming was not included since students expressed great concern that the course might be too technical or mathematical for them. However, this year for the first time, students are being oriented to computer programming and are learning commonly used BASIC commands and instructions. They read, modify, write and run simple BASIC programs on an interactive system using both a CRT and a teletype. The students are doing remarkably well and have developed a sense of computer logic as well as real time computing.

After gaining some understanding of the technical aspects of computers, the students explore the present and potential applications of computers in the health sciences. Both medical and nursing applications are discussed including hospital and community information systems. The use of computers as a diagnostic tool in medicine is discussed along with a functional diagram which was developed for the medical decision-making process[16]. The diagram provides a basis for discussing the use of algorithms in the decision-making process in nursing. Automated multiphasic health testing is also discussed. In addition, various computer applications in the hospital setting are reviewed.

Unfortunately, there are no area hospitals in which students can obtain first hand experience with an automated medical information system. However, they are able to view a film of the Technicon Medical Information System at El Camino Hospital in Mountain View, California and a videotape of the IBM Patient Care System used at Stony Brook on Long Island. In order to give students an opportunity to better understand some of the impact a computer might actually have in a health care setting, they identify a simple data processing problem in a familiar health setting and then develop a flow chart of it. Following the development of the flow chart of the existing system, they introduce a computer into the system and develop another flow chart. In this way students are able to see the difference a computer might make in a specific situation.

Following the discussion of patient care applications, computer-assisted instruction (CAI) is explored with an emphasis on the actual and potential use of CAI for health science students and graduates as well as for health care consumers. Types of CAI, such as problem-solving, simulation, etc. are introduced. Students are assigned to do one CAI package utilizing a terminal which is in the Health Sciences Library at the State University of New York at Buffalo.

Interaction with the computer has proven to be one of the most valuable experiences of the course for many students. The students have indicated that the actual hands-on experience with interactive computing, both in programming and CAI, has demystified the process of communicating with a computer. The computer has lost many of its "monster" qualities and become more of a "friend" and "tool", one which they can manage and which can be helpful to them. Although acceptance of the computer as a learning tool is important, far more important for the purposes of this course is the expressed change in the students' attitude toward using a terminal.

Considerable time is devoted to the nurse's specific role as a data generator especially in relation to the systematic collection of data and standardized assessment and recording tools are discussed and compared to the commonly used free format recording tools. Discussion focuses on three areas in relation to these two types of recording tools: 1) the informational content of each, 2) the time required to record on each, and 3) the professional's perceived loss of free choice in recording on standardized forms.

The final unit of the course is related to the social and ethical issues of computerization. Confidentiality of health data is a critical issue to all of the students. In discussing the control of access to health information, the rights of the following groups are explored: the patient, the data generator (nurse, physician, social worker, etc.) and the third party payer (insurance company, governmental agency). The students discuss the nature of privacy problems posed through the use of the computer and examine the present system in terms of its safeguards.

One significant fact which has emerged during these discussions is that the students' basic lack of trust is not in the machine side of the man-machine interface but in the human side. This realization coupled with the students' increased understanding of computers has motivated many of them to express interest in becoming actively involved in the development of computerized health information systems. They have begun to realize how important it is for nurses to be involved in decisions about what information is to be stored in the computer, why it is being stored and how it will be used.

Evaluation of the Course

At the completion of the course, students' attitudes are more positive than negative toward computers. They describe their feelings about the use of the computer in health care with words such as: "...will take away much paper work and leave time for quality patient care", "I'd like to try it", "I feel very positive", "They can't get into the system too soon for me". They are able to identify ways in which the computer would enhance professional nursing care rather than threaten it; how it could, if properly used, humanize rather than dehumanize health care.

The students have recommended that many aspects of the course, particularly the applications, be integrated into the undergraduate curriculum for all students. Some of the major areas in the undergraduate curriculum into which selected concepts related to computers might be integrated include:

1. Clinical nursing courses
   a. data collection, recording (including standardized tools), and retrieval
   b. generation of nursing care plans
   c. availability of current and pertinent information for clinical decision-making and evaluation of patient care

2. Leadership and administration
   a. staff scheduling
   b. report generation
   c. availability of appropriate information for administrative decisions
   d. facilitation of quality assurance programs
   e. reduction in clerical tasks

3. Professional issues
   The role of the nurse in a computerized environment[15]

4. Research
   a. information retrieval
   b. statistical analysis

Discussion

The integration of computer concepts and applications into the nursing curriculum poses many

problems. In order to accomplish integration, most if not all nursing educators would have to understand and accept the present and potential role of the computer in health care. Such understanding and acceptance is currently not possessed by most nursing faculty members. The nursing educators who are familiar with computers are usually researchers who have used the computer for statistical analysis. Although this application of the computer is important, knowledge of it is not as essential for a practitioner of nursing as are clinical, administrative, and educational applications.

Why is it that content related to the use of computers in health care is not included in most baccalaureate curricula. One reason as indicated above is that many, perhaps most, educators have never been exposed to automated health care systems either in their education or practice. Although computers are ubiquitous in contemporary society, their use in health care is relatively limited, and relevant courses in graduate programs which prepare teachers of nursing are not common. Another important factor may be educators' attitudes toward the use of computers in health care. Negative attitudes could prevent them from learning about computers in health care and from taking the initiative in forming collaborative relationships with computer scientists. Some of the studies which have been done to identify the attitudes of health personnel toward computers indicate that nurses tend to have negative attitudes toward computers in the area of dehumanization and loss of control[4], [17], [18]. Other studies suggest that information about and experience with computers improves nurses' attitudes toward computers[19], [20], [8]. Unfortunately, the attitudes of nurse educators toward computers are not included in any of the above studies. Are their attitudes the same as those of the nurses studied in the research reported above? The answer to this question is important, for whatever their attitudes, they are a critical element in the development of nursing school curricula which will include the nursing implications of computer technology.

A third influence may be nursing educators' view of their role with respect to preparing students for the future. Since computers are not part of present day practice for most nurses (educators or practitioners), inclusion of information about computers would require the nurse educator not only to view the computer as an integral part of a nurse's future, but also to believe it is her responsibility to prepare nurses for the future. This would necessitate difficult decisions with respect to the priority of future-oriented content in the curriculum.

A study is currently being developed by the author to explore the influence of these factors on the attitudes of nurse educators toward the incorporation of computer concepts into the nursing curriculum. This information will be utilized to plan appropriate faculty development programs so that nursing faculty members will be able to prepare their students to practice collaboratively with a computer. Nursing educators cannot afford

to remain unsophisticated about the use of computers in health care for long. Soon incoming students will possess computer literacy and will expect answers to questions about the application of the computer to health care. Today's nursing students will be required to take an active part in the evaluation and development of computerized systems which will help them provide humanistic health care. It is the nursing educators who have the responsibility for providing students with the tools to do this. If the educators do not accept this responsibility, health care systems will be developed without the benefit of nursing participation. Non-nurses will define what and how information will be recorded by nurses, the use of that information will be recorded by nurses, the use of that information and the accessibility of information recorded by other health professionals to the nurse.

Similar problems exist for all of the health professions. Unless all health professionals have sufficient knowledge to participate in the development of computerized systems, systems will be developed by computer specialists and imposed on health professionals. If this occurs, neither health professionals nor patients will realize the full benefits that computerization can bring.

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